

# Diversity on a tropical sky island: two new species of *Plectranthus* L.Hér. (Lamiaceae) from the Hann Tableland, north-east Queensland

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## Summary

Forster, P.I. (2014). Diversity on a tropical sky island: two new species of *Plectranthus* L.Hér. (Lamiaceae) from the Hann Tableland, north-east Queensland. *Austrobaileya* 9(2): 207–215. A remarkable array of *Plectranthus* populations occurs on boulder and pavement fields on the geographically isolated Hann Tableland west of Mareeba in north-east Queensland. Seven species are present, namely *P. bellus* P.I.Forst., *P. bipartitus* P.I.Forst. sp. nov., *P. congestus* S.T.Blake, *P. foetidus* Benth., *P. mirus* S.T.Blake, *P. spectabilis* S.T.Blake and *P. splendens* P.I.Forst. sp. nov. The newly described species are illustrated and a distribution map is presented to all the species of *Plectranthus* on the Hann Tableland.

Key Words: Lamiaceae, *Plectranthus*, *Plectranthus bipartitus*, *Plectranthus splendens*, Australia flora, Queensland flora, Hann Tableland, new species, taxonomy, sky island, conservation status

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## Introduction

The genus *Plectranthus* L.Hér. is diverse in Australia, with over 40 species described so far. Most species are boulder or pavement specialists where they grow in shallow, skeletal soils. These habitats can be variable within themselves, with a matrix of ‘micro environments’ and the plants that occur often do so in narrow bands or patches determined by soil depth and moisture. These physical and edaphic factors, compounded by geographic isolation and the breeding biology of these herbs or subshrubs are thought to have driven speciation in eastern Australia (Forster 2011) resulting in a mix of widespread species and narrowly distributed endemics.

The Hann Tableland is a massive, geographically isolated granite pluton nearly 30 × 6 km in area and is located west of Mareeba in north-east Queensland. The granites of the tableland are part of the Kennedy Province Granites, specifically the Whypalla Supersuite and have been dated as early Permian (275 ± 15 Ma) in age (Champion & Bultitude 2013). The topography of the

Hann Tableland ranges from c. 350 m at its base with the surrounding foothills to high points of 950–1000 m. From north to south, the tableland runs roughly south-southwest with gentle to very steep slopes. Much of the tableland is covered in woodland; however, some gully systems and high points have closed forests (rainforests). Interspersed throughout the woodland ecosystems are large areas of outcropping rock characterised by extensive areas of pavement and small to massive boulders or outcrops. These latter habitats have shallow to no soil cover and usually have vegetation that is markedly seasonal, comprising a mixture of grasses, sedges and other herbs. This ‘ephemeral flush’ vegetation (Porembski *et al.* 2000) has relatively few perennial species; these are generally woody with either deep or lateral, water seeking roots, are resurrection plants (e.g. *Borya septentrionalis* F.Muell., *Cheilanthes* spp.), or in the case of *Plectranthus* species have fleshy to succulent rootstocks and foliage.

The Hann Tableland pluton is a ‘sky island’ (Heald 1951; Watling & Donnelly 2006) as it is surrounded by other geology (metasediments) at lower altitudes and is geographically disjunct from other granite massives of the

Whypalla Supersuite (e.g. Bakers Blue, Mount Windsor Tableland/Daintree National Park). The upland vegetation and flora on the Hann Tableland is in part refugial in composition (particularly the rainforest communities, to a lesser extent the woodland communities); however, the plant communities on skeletal soils exhibit a low level of localised endemism by the presence of species such as *Stylidium elachophyllum* A.R.Bean & M.T.Mathieson and the two species described here. The presence of these plant species, together with a number of insects (Bouchard & Brooks 2004) reinforces the hypothesis that the Hann Tableland comprises an area of biodiversity endemism. The sharing of some species (e.g. *Plectranthus bellus* P.I.Forst., *Pterostylis caligna* M.T.Mathieson) from these communities with similar habitats elsewhere (e.g. Mount Windsor Tableland/Daintree National Park) indicates past, relatively recent dispersal events rather than vicariance. This hypothesis is based on the reproductive biology of the plants listed, reiterating my previous comments (Forster 2011: 387) and the irregular outcropping petrogenesis of the granites and their subsequent erosion over the past 270 Ma (Champion & Bultitude 2013). This recent dispersal has also undoubtedly been responsible for the various populations of *Plectranthus* known from the Hann Tableland, especially those known from one or few populations.

Extensive fieldwork on the Hann Tableland has revealed a large number of *Plectranthus* populations (**Map 1**). Generally a single or two species occur at any one site; however, where two species are present, there is often subtle edaphic separation of plants based on soil depth and seasonal water supply. The co-occurring species are markedly different in morphology and appear to be reproductively isolated as hybrids have not been seen. This reproductive isolation is apparently maintained by genetic differences or in some instances by phenology.

Seven species of *Plectranthus* have now been recorded from the Hann Tableland. Four of these are relatively widespread in north-east Queensland, viz. *P. congestus*

R.Br., *P. foetidus* Benth., *P. mirus* S.T.Blake, *P. spectabilis* S.T.Blake; one has a more restricted distribution between the Mount Windsor Tableland and Daintree National Park, viz. *P. bellus*, and two are newly described in this paper.

## Materials and methods

Fieldwork on the Hann Tableland was undertaken between 2006 and 2013 with the use of helicopters to explore isolated or remote areas of suitable habitat in 2010 and 2013; however, due to the rugged vastness of the area further exploration is still warranted. Specimens were prepared in the field or from material cultivated in a garden in Brisbane. Six or more seedlings were collected from populations selected for further study using cultivated plants. Descriptions and illustrations were prepared from cultivated plants.

## Taxonomy

***Plectranthus bipartitus* P.I.Forst. sp. nov.** Distinct within Australian *Plectranthus* by the bipartite form of the individual cymes of the verticillasters and the extensive two-tiered indumentum, particularly glandular trichomes and ‘micro’ glandular papillae. **Typus:** Queensland. COOK DISTRICT: Hann Tableland National Park, southern end; west of Mareeba, 8 April 2013, *P.I. Forster PIF39595* (holo: BRI [2 sheets + spirit]; iso: CNS, K, MEL distribuendi).

Erect herb or subshrub to 100 cm high; foliage with very strong sweetly aromatic scent when crushed, somewhat clammy; non-glandular and glandular trichomes uncoloured, sessile glands absent. Roots thickened-tuberous to fibrous. Stems square, erect to rarely straggling, fleshy-succulent, easily snapped without obvious stringy fibres, the lower parts up to 9 mm diameter, pale green, upper parts with persistent indumentum, non-glandular trichomes sparse, divaricate to weakly retrorse, 6–8-celled up to 0.5 mm long, glandular trichomes dense, variable length to 0.3 mm. Leaves discolorous, petiolate; petioles 10–21 × 2–3.5 mm, channelled on top, non-glandular trichomes sparse, divaricate, 6–8-celled up to 1 mm long,

glandular trichomes dense, variable length to 0.3 mm; laminae ovate to broadly ovate, firm fleshy, weakly keeled, 35–110 × 27–105 mm, crenate with 8–10 teeth up to 12 mm long on each margin, of similar length along margin, secondary teeth usually present; tip acute; base rounded to truncate; upper surface mid-green, veins deeply impressed, non-glandular trichomes sparse, divaricate, 6–8-celled up to 1 mm long, glandular trichomes sparse, variable length to 0.3 mm long; lower surface pale green, somewhat scabrid, veins strongly raised, non-glandular trichomes sparse (denser on veins), divaricate, 6–8-celled up to 1 mm long, glandular trichomes sparse to moderately dense, variable length to 0.3 mm long. Inflorescence up to 300 mm long, usually single with no side branches, pedunculate for 20–30 mm, often with very small subtending leaves; axis square in cross-section, non-glandular trichomes sparse, divaricate, 6–10-celled up to 1.2 mm long and with numerous ‘micro’ trichomes, glandular trichomes dense, up to 0.3 mm long and with dense ‘micro’ papillae; bracts broadly ovate to obovate, 1.7–2 × 1–1.8 mm, ecomose, non-glandular trichomes sparse, divaricate, 6–8-celled up to 0.5 mm long, glandular trichomes dense, up to 0.3 mm long and with dense ‘micro’ papillae; verticillasters 12–20-flowered, 5–6 mm apart; cymes very shortly pedunculate for 0.5–1 mm, bipartite; pedicels 2–2.8 × *c.* 0.3 mm, non-glandular trichomes scattered or occasional, divaricate, 4–8-celled up to 0.6 mm long, glandular trichomes sparse to dense, up to 0.3 mm long and with dense ‘micro’ papillae. Flower calyces 2–2.5 mm long, non-glandular trichomes scattered, divaricate, 6–8-celled up to 0.8 mm long and with ‘micro’ papillae, glandular trichomes sparse and with ‘micro’ papillae. Corolla 7–8 mm long, lilac (mauve), ‘micro’ papillae absent; tube 4.8–5 mm long, curved at 70–90° *c.* 2 mm from the base, not curved upwards, ± glabrous or with an occasional non-glandular trichome 2–4-celled and up to 0.3 mm long; upper lobes orbicular-ovate, erect or slightly reflexed, *c.* 1.5 × 1.5 mm, non-glandular trichomes sparse, divaricate, 4–6-celled up to 0.5 mm long, glandular trichomes usually absent; lateral

lobes oblong, *c.* 1 × 0.7–0.8 mm, glabrous; lower lobe broadly ovate, 4–4.5 × 3.5–4 mm, non-glandular trichomes scattered, divaricate, 4–6-celled up to 0.5 mm long, glandular trichomes scattered; filaments filiform, 7–8 × *c.* 0.2 mm, lilac, fused for 2–4 mm from the base; anthers 0.3–0.4 × 0.25–0.35 mm; style filiform, 9–10 × *c.* 0.2 mm, lilac, bifid for *c.* 0.1 mm. Fruit calyces 3.5–4 mm long; upper lobe oblong-ovate, 1.2–1.5 × *c.* 9 mm; lateral lobes lanceolate-falcate to lanceolate, 1.5–2 × *c.* 0.6 mm; lower lobes lanceolate-falcate, 2–2.1 × 0.5–0.7 mm. Nutlets *n.v.* **Fig. 1.**

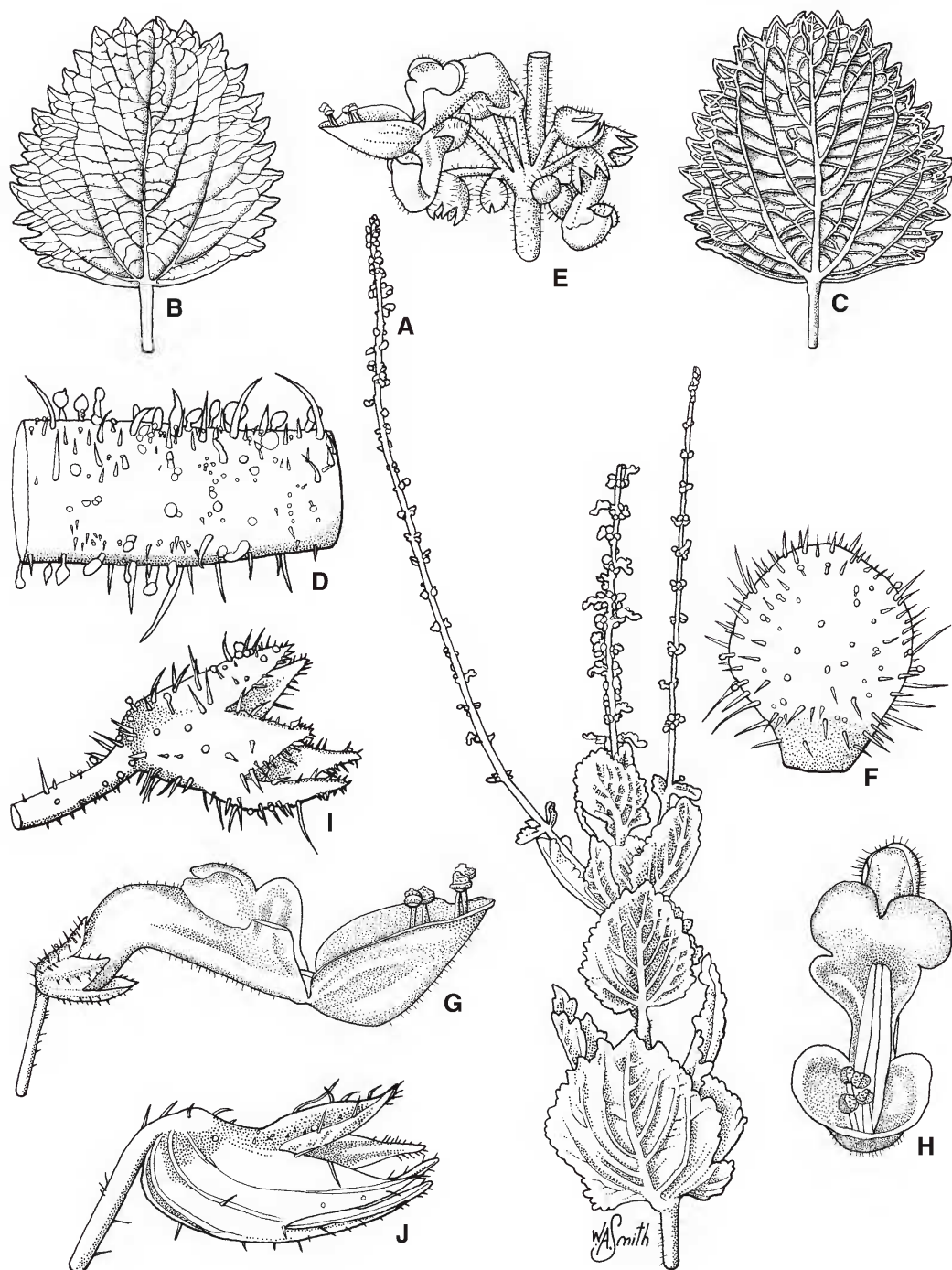
**Additional specimens examined:** **Queensland.** COOK DISTRICT: Hann Tableland, May 1997, *Jago 4344 & Jensen* (BRI); Hann Tableland NP, northern end of tableland; west of Mareeba, Apr 2013, *Forster PIF39690* (BRI, CNS, MEL).

**Distribution and habitat:** *Plectranthus bipartitus* is currently known from two populations from northern and southern ends of the Hann Tableland (**Map 1**). In both instances, plants occur in skeletal soils on steep granite slabs at altitudes between 570 and 815 m in association with seasonal ephemeral flush vegetation, predominantly of grasses, sedges and annual herbs.

**Notes:** *Plectranthus bipartitus* was first collected by Bob Jago and Rigel Jensen in 1997. It is a large and distinctive plant and likely to be noticed by botanical collectors due to its presence on exposed areas of pavement.

*Plectranthus bipartitus* has a number of distinct features that are not present in other Australian species from this genus. There is a passing superficial similarity to *P. diversus* S.T.Blake; however, that species has a combination of leaf morphology and indumentum (especially the widespread occurrence of sessile orange glands), combined with inflorescence structure that is not present in *P. bipartitus*. The bipartite nature of the cymes in *P. bipartitus* is unique in Australian *Plectranthus*. The widespread occurrence of two-tiered indumentum layers (**Fig 1B**), particularly the abundant glandular ‘micro’ papillae on the foliage and inflorescence of *P. bipartitus* is also diagnostic. The occurrence of ‘micro’ papillae on the foliage of other Australian *Plectranthus* is relatively





**Fig. 1.** *Plectranthus bipartitus*. A. habit of flowering stem  $\times 0.4$ . B. adaxial leaf surface  $\times 0.6$ . C. abaxial leaf surface  $\times 0.6$ . D. indumentum on stem indicating two-tiered nature  $\times 24$ . E. bipartite cyme of verticillaster  $\times 3$ . F. floral bract  $\times 12$ . G. lateral view of flower  $\times 6$ . H. face view of flower  $\times 6$ . I. lateral view of flower pedicel and calyx  $\times 12$ . J. lateral view of fruiting pedicel and calyx  $\times 12$ . All from *Forster PIF39595* (BRI). Del. W. Smith.

widespread; however, usually these vary more or less continuously in length with the more obvious cover of fully developed indumentum.

Both populations of this species contained many plants in 2013 and no other species of the genus were present reinforcing the hypothesis that these plants are not the result of any recent hybridisation event. The overall morphology of *Plectranthus bipartitus* is also hard to reconcile with a stabilised hybrid combination from the other species that are present. The apparent (this could be negated with further survey) marked disjunction at the ends of the tableland is repeated to some extent by that of *P. bellus*, although this latter species is known from more populations.

**Conservation status:** Two populations are known for *Plectranthus bipartitus*. Both occur in a National Park; however, as noted for *P. bellus* (Forster 2011), the granite pavement and boulder fields habitats of the Hann Tableland are besieged by a range of alien naturalised species, especially feral pasture grasses such as *Andropogon gayanus* Kunth, *Melinis minutiflora* P.Beauv, *M. repens* (Willd.) Zizka, *Sporobolus pyramidalis* P.Beauv. and the daisies *Bidens pilosa* L. and *Praxelis clematidea* R.M.King & H.Rob. An appropriate conservation status is **Endangered** based upon the IUCN (2001) criterion D.

**Etymology:** The specific epithet is derived from the Latin *bipartitio* (division into two) and alludes to the structures of the individual cymes.

***Plectranthus splendens*** P.I.Forst., **sp. nov.** differing from *P. apreptus* S.T.Blake by being a much more robust erect herb to subshrub (versus a weakly decumbent herb) with strongly scented  $\pm$  firm fleshy foliage with red sessile glands (versus scentless lax foliage with yellow sessile glands), the leaves have fewer teeth (5–8 per margin) that are longer (up to 8 mm long) (versus leaves with more teeth [7–15 per margin] that are shorter [up to 3 mm long]) and the inflorescence is initially weakly comose with much larger (3.2–4 mm long) bracts (versus an inflorescence that is not

weakly comose and has much smaller (1.2–1.8 mm long) bracts). **Typus:** Queensland. Cook DISTRICT: Hann Tableland National Park, 8 April 2013, *P.I. Forster PIF39587* (holo: BRI [2 sheets + spirit]; iso: CNS, K, MEL *distribuendi*).

Erect to rarely decumbent subshrub to 100 cm high; foliage with very strong sickly sweet scent when crushed, scabrid; non-glandular and glandular trichomes uncoloured, sessile glands 8-celled, dark orange. Roots thickened fibrous. Stems square, erect to rarely straggling, fleshy-succulent, easily snapped without obvious stringy fibres, the lower parts up to 8 mm diameter, pale green to flushed purple, upper parts with persistent indumentum, non-glandular trichomes generally absent or rarely 6–9-celled and up to 0.8 mm long, glandular trichomes dense, to 0.8 mm, sessile glands absent. Leaves discolorous, petiolate; petioles 20–45  $\times$  2–3.5 mm, channelled on top, non-glandular trichomes absent or scattered, divaricate and 6–8-celled to 0.8 mm long, glandular trichomes sparse to dense, to 0.8 mm, sessile glands absent; laminae broadly ovate to somewhat subcordate, rarely reniform-cordate,  $\pm$  firm fleshy, keeled when young, flatter with age, 28–70(90)  $\times$  28–80(110) mm, dentate with 5–8 teeth up to 8 mm long on each margin, of similar length along margin, secondary teeth usually present; tip acute; base subcordate to truncate; upper surface glossy mid-green, scabrid, veins impressed, non-glandular trichomes sparse to dense, antrorse to divaricate, 6–8-celled up to 1 mm long, glandular trichomes sparse to dense, to 0.8 mm long, sessile glands absent; lower surface pale green to silver green (due to the indumentum) and sometimes with a reddish hue (due to sessile glands), scabrid, veins strongly raised, non-glandular trichomes sparse to dense, divaricate, 6–8-celled up to 1 mm long, glandular trichomes sparse to dense, to 0.8 mm long, sessile glands absent, or scattered to dense. Inflorescence up to 210 mm long, single with 1 or 2 side branches, pedunculate for 15–20 mm; axis square in cross-section, non-glandular trichomes absent or a few near vertillasters, divaricate, 6–8-celled up to 0.8 mm long, glandular trichomes dense,

up to 0.8 mm long, sessile glands absent; bracts broadly ovate to subcordate, 3.2–4 × 3.5–5 mm, loosely comose near top of inflorescence, but soon shed, non-glandular trichomes sparse, divaricate, 5–8-celled up to 0.5 mm long, glandular trichomes sparse to dense, up to 0.5 mm long, sessile glands occasional; cymes sessile; verticillasters 10–14-flowered, up to 13 mm apart; pedicels 3.6–6 × c. 0.4 mm, non-glandular trichomes occasional, divaricate, 4-celled up to 0.1 mm long, glandular trichomes sparse, up to 0.2 mm long, sessile glands absent. Flower calyces 2.2–2.5 mm long, non-glandular trichomes scattered, antrorse, 4-celled up to 0.2 mm long, glandular trichomes sparse, sessile glands sparse. Corolla 10–11 mm long, purple and white to deep blue-purple; tube 5.5–6 mm long, curved at c. 90° c. 3 mm from the base, not curved upwards, glabrous; upper lobes suborbicular, erect, 2.2–2.5 × 2.2–2.5 mm, non-glandular trichomes occasional, divaricate, 2–4-celled up to 0.2 mm long, glandular trichomes sparse, sessile glands occasional; lateral lobes oblong, 2–2.2 × c. 1 mm, glabrous, purple with central white blotch; lower lobe broadly ovate, 5.5–6 × 4–4.2 mm, non-glandular trichomes occasional, divaricate, 2–4-celled up to 0.1 mm long, glandular trichomes occasional, sessile glands occasional or absent; filaments filiform, 8–9 × c. 0.1 mm, lilac, fused for c. 3 mm from the base; anthers c. 0.4 × 0.3 mm; style filiform, 8–10 × c. 0.1 mm, lilac, bifid for c. 0.3 mm. Fruit calyces 3–3.3 mm long; upper lobe oblong-ovate, 1–1.2 × c. 1.5 mm; lateral lobes lanceolate-falcate, 1.2–1.3 × 0.8–0.9 mm; lower lobes lanceolate-falcate, 1.2–1.5 × 0.5–0.6 mm. Nutlets ± circular in outline, flattened to somewhat convex, 0.7–0.9 × 0.8–0.9 mm, glossy brown, somewhat tessellate. **Fig. 2.**

**Additional specimens examined:** Queensland. COOK DISTRICT: Northern end of Hann Tableland, NW of Mareeba, Apr 2005, *Wannan 3955 & Ray* (BRI, NSW), Oct 2005, *Wannan 4126 & Jago* (BRI); Hann Tableland NP, May 2010, *Forster PIF36941* (BRI, CNS), May 2010, *Forster PIF37194* (BRI, CNS, MEL), Mar 2012, *Mathieson MTM1299* (BRI, DNA), Apr 2013, *Forster PIF39592* (BRI, CNS, MEL, NSW), Apr 2013, *Forster PIF39725* (BRI, CNS, MEL, NSW); Hann Tableland, near radio tower (cult Tolga), May 1995, *Sankowsky 1467 & Sankowsky* (BRI), Jul 1995, *Forster PIF17165*

(BRI, CNS, DNA, L, MEL, NE, PE); Hann Tableland, near Radar Station, May 2004, *McDonald KRM2471* (BRI, DNA, MEL, NSW), May 2006, *Forster PIF31718 & McDonald* (BRI, MEL, NE, NSW); Hann Tableland, NW of Mareeba, Oct 1973, *Webb & Tracey 11649* (BRI); Boyle Pocket, Hann Tableland, Mar 2000, *Thompson SLT2613* (BRI).

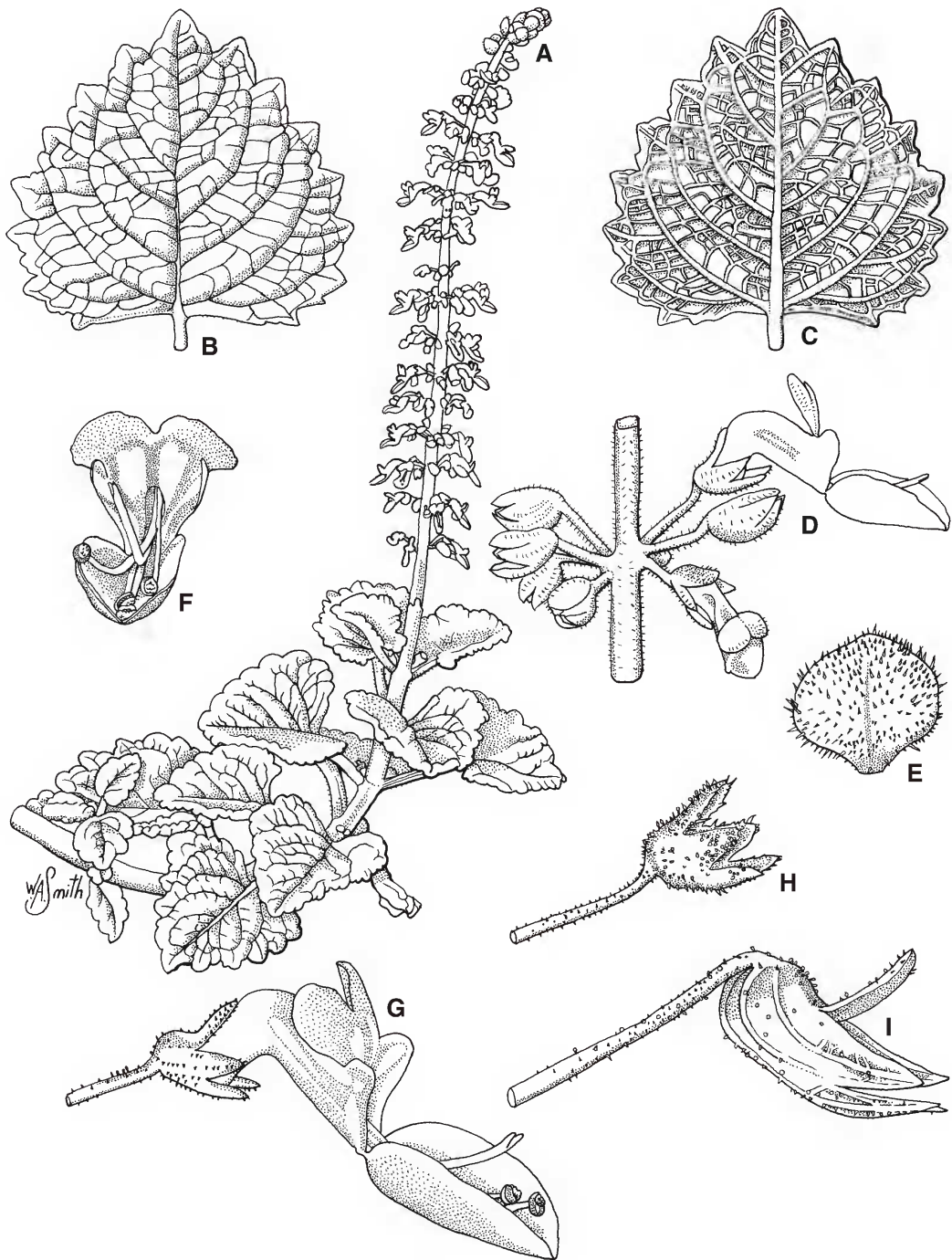
**Distribution and habitat:** *Plectranthus splendens* is endemic to the Hann Tableland (**Map 1**) where it is widespread – occurring predominantly on areas of pavement, but is also to be found on large boulders within areas of woodland or open forest. It is the most widespread *Plectranthus* on the Hann Tableland after *P. spectabilis* and the two species are sometimes sympatric.

**Notes:** *Plectranthus splendens* might be related (on the basis of morphology) to the more coastal occurring *P. apreptus* S.T.Blake and some collections from the Hann Tableland have been identified and distributed under that name. The two species differ in a number of characters. *P. splendens* is a much more robust erect herb to subshrub with strongly scented ± firm fleshy foliage with red sessile glands, the leaves have fewer teeth (5–8 per margin) that are longer (up to 8 mm long) and the inflorescence is initially weakly comose with much larger (3.2–4 mm long) bracts. By comparison *P. apreptus* is a weakly decumbent herb with yellow sessile glands, scentless thin fleshy foliage, the leaves have more teeth (7–15 per margin) that are shorter (up to 3 mm long), the inflorescence is not weakly comose and has much smaller (1.2–1.8 mm long) bracts.

The populations from the Hann Tableland included within this species vary in the degree of indumentum cover and the disposition of the sessile glands on the foliage. Some plants (generally throughout a whole population) have noticeably shaggier foliage (due to greater density of indumentum) than others. A couple of populations have very dense red sessile glands on the leaf undersurface that impart a reddish colour to the surface; however, this feature seems to be variable and can be more or less absent.

This attractive species appears to have been first collected by Len Webb and Geoff Tracey in their pioneering botanical explorations of





**Fig. 2.** *Plectranthus splendens*. A. habit of flowering stem  $\times 0.5$ . B. adaxial leaf surface  $\times 1$ . C. abaxial leaf surface  $\times 1$ . D. verticillaster  $\times 4$ . E. floral bract  $\times 4$ . F. lateral view of flower  $\times 6$ . G. face view of flower  $\times 6$ . H. lateral view of flower pedicel and calyx  $\times 8$ . I. lateral view of fruiting pedicel and calyx  $\times 8$ . All from Forster PIF39587 (BRI). Del. W.Smith.

the Hann Tableland rainforests in 1973. The species is likely to become widespread in cultivation as it is easy to grow in frost free gardens and spreads vigorously by layering. Most material already in cultivation by native plant enthusiasts emanates from the population near the radar station based on a collection made by Garry and Nada Sankowsky prior to 1995. This particular population of plants is notable for the more or less complete absence of red sessile glands from the leaf undersurface.

**Conservation status:** *Plectranthus splendens* is widespread on the Hann Tableland with most of the known populations present in the National Park. As noted for *P. bellus* (Forster 2011) and for *P. bipartitus* (above), the habitats where this species occurs are besieged by alien invasive weeds. In 2013, the populations of *P. splendens* were little affected by these weed invasions; however, it is difficult to predict what may eventuate in the future as the aliens expand their distribution. An appropriate conservation coding for *P. splendens* is **Vulnerable**, based on the criterion D2 (IUCN 2001).

**Etymology:** The specific epithet is derived from the Latin *splendens* and alludes to the attractive appearance of this plant.

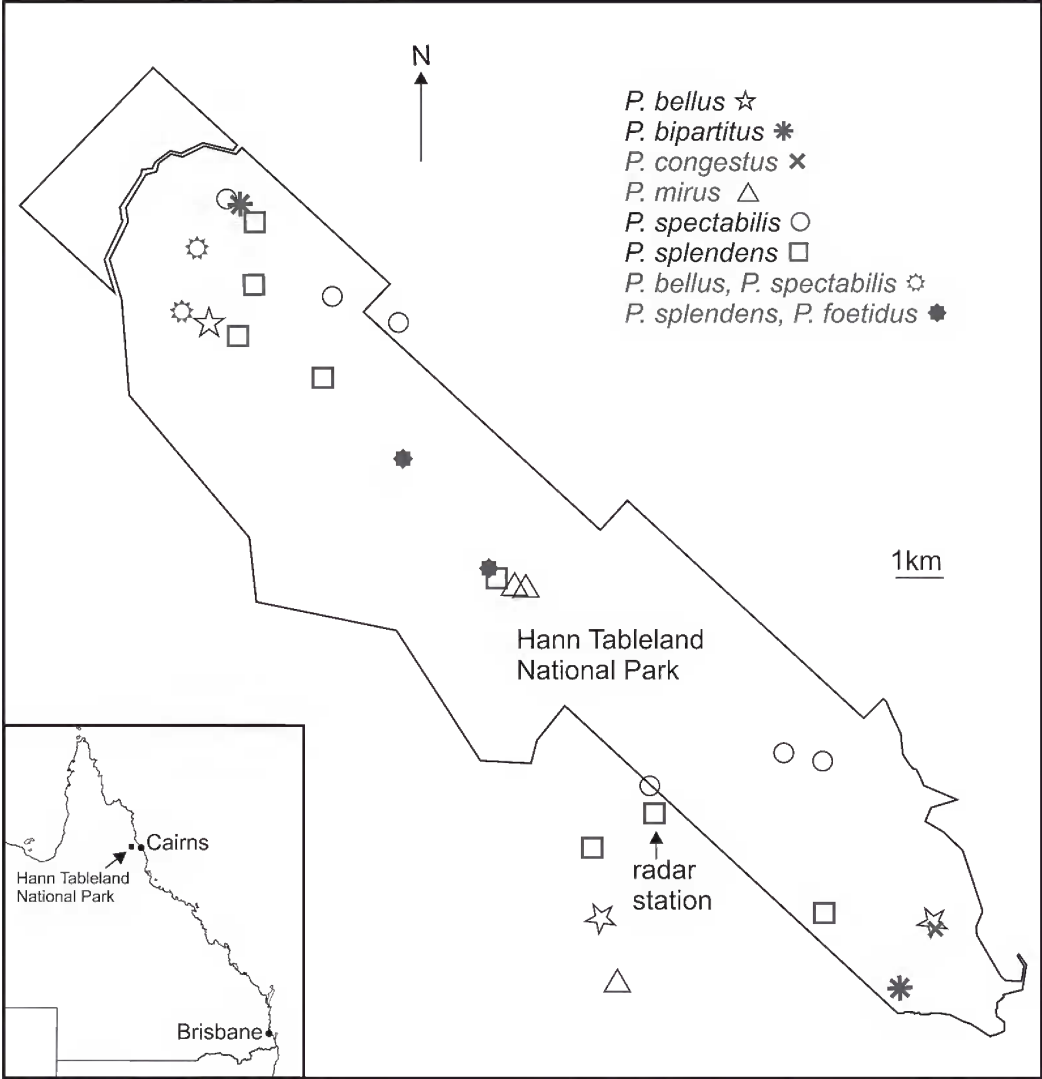
### Acknowledgements

Some of the cited field collections were made on Bush Blitz (Commonwealth Government) supported expeditions in 2010 and 2013. Assistance with field work and plant material was provided by Garry and Nada Sankowsky (Tolga), Keith McDonald (Atherton), Mike Mathieson and Megan Thomas (Queensland Herbarium); traditional owners for the Hann Tableland (John & Troy Grainer), National Parks & Wildlife Service staff (Jonathon Roth, Robert Miller). Cape York Helicopters provided excellent logistical support.

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**Map 1.** Distribution of *Plectranthus* species on the Hann Tableland, north-east Queensland. Outline indicates the extent of the National Park.